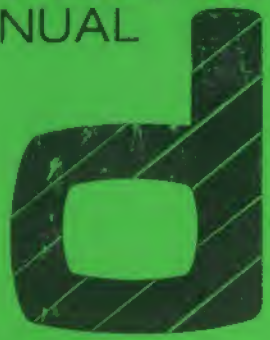
INSTRUCTION
MANUAL



DIGICARD

64K EXTENDED 80 COLUMN RGB CARD FOR APPLE//E

Designed and manufactured in Australia by
Maclagan Wright & Associates Pty Ltd
11/22 Bridge St. Eltham, Vic. 3095

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All DIGICARD products are designed and manufactured in Australia by:-

MACLAGAN, WRIGHT & ASSOCIATES PTY. LTD.
Shop 11, Cedar Village,
22 BRIDGE STREET, ELTHAM, VICTORIA, 3095

INTRODUCTION

The DIGICARD extended 80 column R.G.B. card was designed to allow the Apple //e to operate a colour monitor with Red, Green and Blue inputs (R.G.B. monitor) without losing other facilities the auxiliary slot offers. Namely an additional 64K of Random Access Memory. (RAM)

Having 64K of additional RAM installed in the Auxiliary slot of the Apple //e ensures that your computer will be able to make the most out of Apple's new professional packages and, for the graphics oriented, increases the Apple's HI-RES graphics resolution to 560 dots or pixels accross the screen.

The DIGICARD extended 80 column R.G.B card even enhances the standard Apple HI-RES screen with a sophisticated interpreting system that produces results far superior than are possible with more conventional R.G.B. cards.

The DIGICARD extended 80 column R.G.B. card emulates Apple's Extended 80 column card while providing output suitable for analogue R.G.B. (Red Green Blue) monitors such as the KAGA range.

INSTALLATION

CAUTION:- Power to the APPLE must be turned off for installation.

1> Remove the cover from the Apple //e by pressing the rear corners upward until they pop free. Slide the co - toward the rear of the APPLE and remove.

2> At the rear of the Apple //e's main board there are seven slots numbered 1 to 7 and in front of slot three, (toward the keyboard) there is a special slot called the auxiliary slot. The DIGICARD extended 80 column RGB card will only function in the auxiliary slot.

3> Touch the power supply cover to remove any static charge you may be carrying. (This is a good time to check that the power to the APPLE is definitely OFF.)

4> Hold the card in your left hand with the main gold connector strip pointed downward and the side of the board containing components toward your right.

5> Using a rocking motion carefully insert the DIGICARD into the auxiliary slot (in front of slot 3) and check it is firmly seated.

6> Thread the small-connector end of the video lead supplied with the card through one of the smaller slots in the back of the Apple //e and connect it to the connector pins on the top rear of the card.

7> Connect the other end (large connector) to the connector on the rear of your R.G.B. monitor.

8> Locate the two wire lead coming from the switch under the front of the Apple keyboard. This lead is normally plugged onto the Apple main board in the centre at the keyboard end. Do not confuse it with the speaker lead which is further to the left.

9> Remove this lead from the Apple main board. Remove the small jumper plug from the bottom, keyboard end of the DIGICARD and swap them over. The jumper link should go to the Apple main board two pins marked 'switch' and the switch wires should be connected to the DIGICARD connector LK2. If you prefer the Apple text character set to have the British pound sign instead of a hash symbol you may leave the jumper link off the Apple board.

That completes the installation of the R.G.B 64K card. You should now refer to the section 'TEXT COLOUR AND GRAPHICS MODES' on page 16 to set the text colour combination switches, then you should replace the lid of your Apple and test the card. Note that the switch under the front of the Apple now changes the Apple HI-RES modes between colour and monochrome.

OPERATION

If you have purchased the DIGICARD extended 80 column R.G.B. card to run commercial software there is no need to do anything after your card is installed except check that it is functioning OK. Software that uses 80 columns and the extra 64K of RAM will automatically locate and use the card.

The 80 column card is essentially located in slot 3 of the Apple so to use the 80 column card with Applesoft BASIC it is 'booted' in the normal way a printer or any other peripheral card is.

Type PR#3 or, from a machine language program, JSR $C300.

WHAT VIDEO MONITOR DO I USE?

The standard 40 column display that the Apple produces was designed to enable just about any black and white monitor or colour television set to be used with it.

As more information is put on the screen the need for a better monitor increases. If you intend to use 80 columns with an R.G.B. monitor you should be aware that many R.G.B. monitors are not sufficiently high-resolution to allow 80 column characters to be easily read.

In the KAGA range of R.G.B. monitors the Vision I is really suitable only for 40 column use while the Vision II is quite usable in 80 column mode. The Vision III is slightly better again if high quality 80 column results are required.

GETTING BACK TO 40 COLUMNS

There are two methods of switching back to 40 columns. These are:-

ESC 4

Switches to 40 column 'extended edit' mode.

(If ESC 4 was used to switch to 40 columns the command ESC 8 can be used to switch back to 80 columns.)

ESC ctrl Q

Switches to 40 columns then deactivates the 80 column card entirely.

From within an Applesoft BASIC program switching to 40 columns is accomplished by printing CHR$(21).

Example: Boot 80 columns then switch back to 40 columns:-

```
10 PRINT CHR$(4)"PR#3": PRINT
20 PRINT "THIS IS THE 80 COLUMN MODE"
30 PRINT CHR$(21)
40 PRINT "AND BACK TJ 40 COLUMNS."
```

MORE 'ESC' COMMANDS

The 80 column card firmware in the Apple //e responds to all the normal ESC codes that are used by the standard 40 column display. When the card enters ESC mode the cursor changes from an inverse block to an inverse block with a plus sign in it.

There are two ESC commands left to tell you about. These are:-

ESC R

Enters uppercase RESTRICT mode.

ESC T

Toggles back to unrestricted mode.

When uppercase restict is active all characters typed except for those inside inverted commas will be restricted to upper case.

NO NO! NOT PR#0

The command PR#0 MUST NOT be used to return output to the 80 column card after a printer access. Program destruction will almost surely result if this command is given in 80 columns. To return printing to 80 columns simply re-boot with PR#3.

PARALLEL PRINTERS

Most parallel type printer cards and some Serial cards (Apple's SSC card is one) available for the Apple, echo characters back to the 40 column screen when you are printing.

Echo of characters to the 40 column screen while using 80 columns may result in disaster due to incorrect text window settings. For this reason Echo must be disabled immediatly following printer access.

Echo disable is normally accomplished with the command PRINT CHR$(9)"80N" from a line in Basic, the "80N" part of the command is to set the printer width 80. In immediatte mode (from the keyboard) typing Ctrl I 80N achieves the same result.

These commands are not necessary when using the DIGICARD PARALLEL PRINTER CARD as the DIGICARD turns off echo to the 40 column screen if the 80 column card is active.

A normal sequence to turn a parallel printer on and off from a program is shown in the following example:-

```
70 D$=CHR$(4)
80 PRINT D$"PR#1":REM--PRINTER ON SENT TO DOS
90 PRINT CHR$(9)"80N":REM--TURN ECHO OFF AND
ENSURE 80 COLUMNS
100 PRINT"THIS WILL GO TO THE PRINTER"
110 PRINT D$"PR#3":REM--SEND PR#3 TO DOS
120 PRINT"NOW BACK ON THE 80 COLUMN SCREEN"
```

TEXT WINDOW POKES

The locations used for the text window are the same for 80 columns as for the 40 column APPLE screen, these are outlined on the following page with maximum and minimum values allowable when in the 80 column display.

Normal precautions as laid out in the APPLE manual also apply to text window pokes, such as, the sum of left edge and width should not exceed 80.

NOTE:- The 80 column firmware will only respond correctly to even values poked to the window width. If an odd value is used the software will reduce it by one to the next lowest even value.

PURPOSE	HEX LOC.	DECIMAL LOCATION	MIN	MAX	NORM
Left edge	$20	32	0	79	0
Width	$21	33	0	80	80
Top edge	$22	34	0	23	0
Bottom edge	$23	35	0	24	24

HTAB AND VTAB

HTAB

Applesoft BASIC only responds to HTAB up to 40. To effectively tab with 80 columns HTAB is replaced with the statement POKE 36,n where 'n' is the horizontal position required. This value should be between 0 and 79.

Note that HTAB 1 is the same as POKE 36,0.

VTAB

Use of VTAB is exactly the same as normal APPLE 40 column display.

SCREEN CONTROL CODES

The 80 column firmware in the Apple //e responds to several control codes used by CP/M Pascal etc. These codes may also be used by APPLESOFT BASIC for greater versatility in screen formatting.

To use control codes from APPLESOFT BASIC, issue the command PRINT CHR$(XX) where XX is the decimal value given in the "SCREEN CONTROL CODES TABLE" on the following page.

From PASCAL the normal technique to print control characters should be used. ie:-WRITE (CHR(XX));

Using screen control codes from within APPLE CP/M (regardless of version) is slightly more complex due to the 'hardware/software' table in CP/M. This table converts codes printed from applications running within CP/M to codes suitable for the 80 column system in the APPLE. To look at what codes to use for a given function you should run the MBASIC program CONFIGIO on your CP/M master disk and check the terminal configuration table.

APPLE CP/M is usually set up to convert SORAQ software codes to DATAMEDIA hardware codes.

ie:- To clear the screen send ESC *

SCREEN CONTROL CODES TABLE

ASCII NAME	DECIMAL VALUE	FUNCTION
BEL	7	Sound system bell.
BS	8	Non dest. backspace.
LF	10	Linefeed
VT	11	Clear to end of window.
FF	12	Formfeed.(HOME)
CR	13	Carriage return.
SI	14	Set "NORMAL" display.
SO	15	Set "INVERSE" display.
DC1	17	Set display to 40 columns.
DC2	18	Return to 80 column display.
NAK	21	Deactivate 80 column card.
SYN	22	Reverse scroll.
ETB	23	Scroll.
EM	25	Home cursor, no clear.
SUB	26	Clear the current cursor line.
FS	28	Non dest.forward space.
GS	29	Clear to end of line.
RS	30	GOTO X,Y lead in.

80 COLUMN VIDEO IN THE APPLE //e

When DOS is booted in the Apple //e with the command PR#n, the 40 column input/output vectors are initialized, ignoring the 80 column card entirely. This means that if the 80 column display was active at the time DOS is booted the 80 column firmware is disabled but the hardware is still on resulting in garbage on the screen.

Using ctrl-open Apple reset rather than PR#n prevents this problem. Apple recomends that software written for the 80 column expansion turn the card off at the end of the program. This can be done by printing CHR$(21).

Note that PR#3 does not initialize the 80 column firmware until the first character has been printed to it. Therefore commands such as HOME, VTAB etc will be ignored until a character is printed.

To prevent any such problems follow the booting of the 80 column card (from within an Applesoft program) with a single print.

```
eg.  10  PRINT CHR$(4)"PR#3": PRINT
     20  HOME: VTAB10: PRINT "HELLO"
```

NOTE:- The firmware for the DIGICARD 2E 80 column card is entirely contained on the main board of the Apple //e; as such any firmware characteristics of the 80 column display or input system cannot be changed except by Apple themselves in later enhancments of firmware.

RESET

Reset deactivates both the 80 column firmware and hardware and returns control to the 40 column screen.

INVERSE, NORMAL, FLASH AND HOME

INVERSE

The statement INVERSE will have the same effect on video with the 80 column display as in 40 columns. ie:- Black characters on a white background.

Please consult the background/foreground colour table on page 18 for actual colours.

NORMAL

NORMAL sets the screen to white characters on a black background as in 40 columns. See again the background/foreground colour table.

FLASH

FLASH is not available with the 80 column card and should not be used.

HOME

HOME clears the screen to whatever state (INVERSE or NORMAL) was set last. This is different the standard 40 column display which will only clear to a black screen. Refer to the background/foreground colour table for details.

GET A KEY

The 80 column card firmware in the Apple //e does not support the Applesoft BASIC 'GET' function in the same way that the 40 column screen does. The two keys 'ESC' and 'forward copy' (right arrow) will be interpreted by the 80 column firmware thereby making it impossible to return these two values.

ie:- CHR$(27) and CHR$(21) can not be returned by the GET statement.

If the ESC key is typed in answer to a GET statement the 80 column firmware will enter ESC mode.

Likewise, if the forward copy (right arrow) key is pressed the character returned is the character under the cursor.

POKE 36,N

There are some unlikely combinations of POKE 36,n that cause problems in 80 column screen formatting. If problems are encountered replace the statement with:- POKE 1403,n

This statement can replace POKE 36,n wherever it is used with the Apple //e 80 column system.

TEXT COLOUR AND GRAPHICS MODES

As stated earlier, application programs that require them will automatically locate and use both the 80 column display and the extra 64K of RAM (Random Access Memory) that the DIGICARD extended 80 column RGB card provides.

Even so there are several features of your DIGICARD extended 80 column RGB card that make it much more sophisticated than simply an RGB, 80 column or 64K RAM card. Some of these features allow you to select different types of display by changing the position of switches or jumper blocks on the card.

Lets start with a list of all the text and graphics screens that your Apple //e now has the use of.

40 COLUMN TEXT DISPLAY
80 COLUMN TEXT DISPLAY
LO-RES 16 COLOUR GRAPHICS
ME-RES 16 COLOUR GRAPHICS
HI-RES INTERPRETED GRAPHICS
HI-RES MULTI-INTERPRETED GRAPHICS
DOUBLE HI-RES 16 COLOUR GRAPHICS
DOUBLE HI-RES TWO COLOUR GRAPHICS

40 COLUMN TEXT DISPLAY

Using the 40 column text display is covered fully in your Applesoft manual that you received when you originally purchased you Apple //e. The addition of the DIGICARD extended 80 column RGB card now allows you to use the 40 (or 80) column text system with any one of sixteeen combinations of background/foreground and inverse/inverse print colour.
This means that at any one time your text screen may contain up to 4 different colours.

Selection of these colours is made by means of the 4 way pin-switch SW1. This switch is located on the top rear of the DIGICARD extended 80 column RGB card. The table following shows all the combinations of text colour available. The card is shipped with all switches in the ON position giving the combination BLACK background, WHITE normal print, RED inverse block and PINK inverse printing.

The OFF position is when the particular switch is in the position closer to the keyboard end of the Apple.
Switch number 1 is closer to the top of the card.

40 AND 80 COLUMN TEXT DISPLAY COLOUR TABLE

NORMAL BACKGROUND	NORMAL PRINT	INVERSE BLOCK	INVERSE PRINT	SWITCH 1	2	3	4
Black	White	White	Black	OFF	OFF	OFF	OFF
Dark Blue	Yellow	Green	Orange	OFF	OFF	OFF	ON
Black	Green	Aqua	Brown	OFF	OFF	ON	OFF
Black	Med Blue	Yellow	Black	OFF	OFF	ON	ON
Black	White	Orange	Black	OFF	ON	OFF	OFF
Grey	Black	Drk Blue	Light Blue	OFF	ON	OFF	ON
Light Blue	Drk Blue	Orange	Drk Blue	OFF	ON	ON	OFF
Green	Yellow	Brown	Yellow	OFF	ON	ON	ON
Black	Aqua	Med Blue	Orange	ON	OFF	OFF	OFF
Black	Green	Purple	White	ON	OFF	OFF	ON
Drk Blue	Grey	Orange	Drk Blue	ON	OFF	ON	OFF
Black	Grey	Red	White	ON	OFF	ON	ON
Drk Blue	White	Red	Light Blue	ON	ON	OFF	OFF
Red	Grey	Drk Blue	White	ON	ON	OFF	ON
Black	Yellow	Med Blue	Orange	ON	ON	ON	OFF
Black	White	Lum. Red	Pink	ON	ON	ON	ON

80 COLUMN TEXT DISPLAY

The colour combinations described previously for the 40 column system are the same when you are using 80 columns.

LO-RES 16 COLOUR GRAPHICS

This display allows 40 by 48 squares (or large pixels) any one of which may be one of sixteen colours. This display is the same as described in your Applesoft manual except that, in mixed graphics mode, 4 lines of either 40 column text or 4 lines of 80 column text may be displayed at the bottom of the screen. The latter is invoked by booting the 80 column card.

ME-RES 16 COLOUR GRAPHICS

MEdium RESolution graphics is essentially the 80 column equivalent of the normal LO-RES graphics screen. This display allows 80 by 48 squares (or large pixels) any one of which may be one of sixteen colours.

While ME-RES is obtained by using the procedure laid down by Apple, at the time of writing this manual no software was available that used this display.

Using ME-RES is described later in the programming section of this manual.

Use of this display also requires that jumper block LK1 be installed on your card. The card is shipped with jumper LK1 installed

HI-RES INTERPRETED GRAPHICS

If you have not used an Apple 2 plus fitted with an RGB card the advantages of the highly sophisticated interpretive system employed in the DIGICARD extended 80 column RGB cards HI-RES system will not be obvious to you.

This system is used in HI-RES mode when the jumper block is installed on J1, the two pins (of three near the 4 way pin-switch) closer to the keyboard. In this configuration the card uses a very fast form of computing to calculate the required colour on the screen. This results in (largely) a 'what the author of the software intended' display with all single-pixel width lines being presented with a definite colour.

As with LO-RES graphics mode either 40 or 80 column text may be displayed on the 4 lines at the bottom of the screen when mixed text/graphics mode is used.

A more detailed explanation of the HI-RES interpretation system is contained in the programming section of the manual.

With all HI-RES modes the switch under the front of your keyboard will remove all normal HI-RES colour and substitute the background/foreground text colour selection.

HI-RES MULTI-INTERPRETED GRAPHICS

In this mode a single vertical line or pixel will be presented on the screen as a 'washed out' or very light colour. This makes programs using HI-RES printing a lot easier to read.

When there is colour information on the screen the card will still present it in the correct colour however, the first line of colour on the left side will be a lighter shade. With all HI-RES modes the switch under the front of your keyboard will swap from HI-RES to text colour.

DOUBLE HI-RES 16 COLOUR GRAPHICS

This 'new' mode of the Apple HI-RES system is fully supported by the DIGICARD extended 80 column RGB card allowing the display of 140 by 192 pixels. Each pixel may be any one of sixteen colours.

In this mode the colour of any one pixel will not interfere with the colour of any other.

When the card is installed as per the installation instruction at the beginning of this manual this mode is chosen over two colour double HI-RES graphics (see following) with the switch under the front of your Apple.

With normal programming techniques it is only possibly to use 4 lines of 80 column text when mixed text/double HI-RES graphics modes are used. To use double HI-RES jumper block LK1 must be installed.
Please see the section on programming for more details.

DOUBLE HI-RES TWO COLOUR GRAPHICS

As there are effectively two modes of operation available in double HI-RES graphics a method of changing between them is essential. As a soft-switch system to change from monochrome to 16 colour double HI-RES graphics would not be supported by off-the-shelf software, the method chosen was to use the switch under the front of the Apple //e keyboard to change modes.

This switch allows the selection of 16 colour double HI-RES graphics or a monochrome image in full 560 by 192 pixel graphics.

The colour displayed in this mode will be the same as the currently selected text colour normal background/foreground combination.

To use double HI-RES, jumper block LK1 must be installed.
Once again please refer to the section on programming for details on using either double HI-RES mode with your own software.

NOTE:- The double HI-RES system is not currently supported by Applesoft BASIC.

PROGRAMMING INFORMATION

USING THE ADDITIONAL 64K OF RAM

It is difficult to use the extra 64K from Applesoft BASIC without some assembly or machine language experience, however, Apples new operating system, PRODOS, will recognise the card and install it as a RAMDISK in slot 3 drive 2. This RAMDISK can be easily used from PRODOS BASIC as you would a normal disk drive. Under PRODOS the RAMDISK can be accessed by referring to slot 3 drive 2 or by it's installed volume name /RAM.

eg:- **CATALOG,S3,D2** or **CATALOG/RAM**

Assembly or Machine code programs must be used to utilise the auxiliary memory fully. The auxiliary memory switches are tabled on page 35. There are three soft-switches of interest, these are:-

RAMRD
RAMWRT
ALTZP

The RAMRD and RAMWRT switches function in much the same way as the switches used to read and write enable the language card area of the Apple. The area from $0200 to $C000 is referred to as the 48K memory bank. A program must not be actually running in this area when the RAMRD soft switch is actuated unless the program has been copied to the auxiliary memory area.

Copying a program to the auxiliary 48K bank may be accomplished by using the RAMWRT switch to enable writing to the auxiliary 48K RAM, then moving data from one location to the same location within the 48K area.

WARNING:- Do NOT use self modifying code in a program within the 48K area while RAMWRT is active.

There are four combinations of RAMRD/RAMWRT switch settings.

RAMRD	RAMWRT	
Off	Off	Read and write main 48K
Off	On	Read main, write Aux. 48K
On	Off	Write main, read Aux. 48K
On	On	Read and write Aux. 48K

The soft-switch ALTZP enables both read and write to the auxiliary memory areas $0000 to $01FF and $D000 to $FFFF. These memory areas are referred to as Page 0, stack and the Bank switched memory area. For more details on the finer points of using auxiliary memory you should consult the Apple //e reference manual.

USING THE NEW GRAPHICS DISPLAYS

All of the Apple double width or 80 column modes function on the same principle. Bytes to be interpreted for display are alternately taken form the external auxiliary RAM and the Apple main board RAM. All even numbered columns of bytes are taken from the auxiliary RAM while all odd numbered columns are taken from the main Apple RAM. ie:- The first byte displayed on the left of the screen is taken from the auxiliary RAM.

When the 80 column soft-switch, 80COL, is active and the game-port annunciator AN3 has been activated, entry into either LO-RES or HI-RES will result in the display doubling. This is providing that the jumper block that connects the AN3 soft-switch into the card (LK1) is installed. Software then accesses auxiliary or main board RAM by first setting the soft-switch, 80STORE, then changing the page 2 soft switches. Page 2 off for main board RAM and Page 2 on for Auxiliary RAM.

NOTE:-Earlier revision 'A' Apple //e boards will not function when the jumper LK1 is installed. If you have problems check with your dealer as to whether your Apple has a revision 'A' or 'B' main board. The revision code is at the back of main board behind slot three.

USING ME-RES GRAPHICS

The standard Apple LO-RES graphics screen has found many uses in chunky style presentations and was usually used because of its ability to show 16 colours.

ME-RES graphics mode is essentially the same graphics mode except in 80 columns.

Use of ME-RES requires that the Apple effectively be put into 80 column mode, LO-RES graphics mode and the soft-switch annunciator AN3 be activated. (With jumper LK1 installed on the card.)

When these three things are done the screen will show a jumbled set of coloured blocks 80 wide by 40 deep with 4 lines of 80 coloumn text at the bottom of the screen. The reason for the screen not being cleared is because the LO-RES graphics system does not know about the extra screen RAM on the 80 column card.

To ensure that the ME-RES mode comes up with a clear screen the soft-switch that controls on board/off board RAM may be activated and the LO-RES mode invoked twice. Please refer to the BASIC program example at the end of this section to show how this is accomplished.

When the ME-RES mode is activated a typical program will have to calculate each point to be plotted on the screen for X cordinate odd or even and select the appropriate RAM bank. Even X cords are OFF board and odd X cords are ON board.

While most of the LO-RES plotting system is usable in ME-RES mode, the HLIN command will result in a broken line on the screen. This may be circumvented by always using two HLINs, one off and one on board.

Example MEdium RESolution graphics program:-

```
10  REM  -- MEdium RESolution demonstration
             program.
20  REM  -- Set variables for On and OFF
             board pokes.
30 FB = 49237:0B = 49236
40  REM  -- Boot 80 columns, set AN3, set full
             screen and clear bottom 4 lines.
50  PRINT  CHR$ (4)"PR#3": PRINT
60  POKE 49246,0
70  GR : POKE FB,0: GR
80  COLOR= 0: FOR Y = 40 TO 47
90  POKE 0B,0: HLIN 0,39 AT Y: POKE FB,0: HLIN
     0,39 AT Y
100  NEXT
110  POKE 49234,0
120  REM  -- Now do a border around the outside
             of the screen.
130  COLOR= 1
140  POKE 0B,0: HLIN 0,39 AT 0: HLIN 0,39 AT 47
150  POKE FB,0: HLIN 0,39 AT 0: HLIN 0,39 AT 47
160  VLIN 0,47 AT 0
170  POKE 0B,0: VLIN 0,47 AT 39
180  REM  -- Now show general technique for
             calculating odd/even X cords.
190  FOR T = 0 TO 500
200  COLOR=  RND (1) * 16
210 X =  INT ( RND (1) * 78) + 1
```

```
220 Y =  INT ( RND (1) * 46) + 1
230 XR =  INT (X / 2)
240  POKE 0B,0: IF X / 2 = XR THEN  POKE FB,0
250  PLOT XR,Y
260  NEXT
270  REM -- Wipe screen to random colour.
280  COLOR=  RND (1) * 16
290  FOR Y = 0 TO 47
300  POKE 0B,0: HLIN 0,39 AT Y: POKE FB,0: HLIN
      0,39 AT Y
310  NEXT
320  REM -- Set new colour for border and
            do again.
330  COLOR=  RND (1) * 16: GOTO 140
```

INTERPRETED HI-RES EXPLANATION

So far as the final result on your RGB monitor is concerned the system used on the DIGICARD extended 80 column RGB card need not concern you. However if you are using the HI-RES system in a program of your own there are a few things that you may wish to know.

As you are probably aware the Apple HI-RES system limits the colour displayed at any particular point on the screen. ie:- Only an even numbered colour can be displayed at even X cordinate on the screen. The colour can only change (without 'fringing' problems) from violet/green to red/blue every seven pixels. (Or every byte.)

This constraint on artistry comes about 'due to the way colour televisions work' or more clearly because of the way the Apple encodes its NTSC video output.

RGB cards designed for the Apple 2 + were forced to sample the video signal every 4 dots, or every 2 screen dots. This resulted in a 'halving' of the actual resolution of the HI-RES screen. ie:- Dots or vertical line were always shown 2 dots wide.

Because extra video type information is available on the auxiliary slot of the Apple //e the DIGICARD extended 80 column RGB card is able to determine ahead-of-time what the dot pattern is.

This is used in the following way:-

The card samples four dots continuously, if the pattern is apparently a colour then the appropriate colour is used.

In 'double-interpreted' mode an extra decision is made if the pattern indicates only a single dot, then the colour shown is made very light. When two dots are found together the colour is shown as white and similarly black for no dots. If a colour pattern is found the card will also 'fill' the no-dot area of the pattern with a colour.

The nett result of all of this decision making is a close adherence to the HI-RES screen colour system as it would be displayed on an N.T.S.C monitor.

USING DOUBLE HI-RES

Operation of double HI-RES is a little more complicated than ME-RES. A simple alternation of main and auxiliary RAM, based on odd/even 'X' cordinates will not work. This is because the first 7 pixels displayed come from auxiliary RAM and the next 7 from main RAM etc.

To select the correct bank of screen RAM, the actual byte that the pixel is from must be calculated. This is most easily demonstrated in the Applesoft BASIC program following. The techniques used are applicable to machine code programs where, due to the nature of the calcuations, far greater speed would be realised.

The colour routines currently contained in the Apple //e on-board firmware will NOT support colour plotting on the double HI-RES screen.

As described earlier, depending on the setting of the switch under the front of the keyboard, double HI-RES will be displayed in 16 colour 140 * 192 or single colour 560 * 192. In both modes the bytes to be displayed are taken alternately from the 64K external RAM and the Apple main board RAM. In 16 colour mode the colour is decided every four pixels thereby producing 16 different combinations or 16 colours at 140 position accross the screen.

The sample program on the following page shows one technique for plotting on the double HI-RES screen from BASIC.

Example ramndom circle drawer:-

```
10 OB = 49236:FB = 49237:SV = 7
20  HGR
30  POKE 49153,0: REM --80STORE
40  POKE 49152 + 94,0: REM --AN3
50  POKE 49165,0: REM --80COL
60  HGR : POKE FB,0: CALL 62450
70  POKE 49234,0: REM --FULL GRAPHICS
80  HCOLOR= 1
90  POKE OB,0: GOSUB 330
100  HCOLOR= 5
110  POKE FB,0: GOSUB 330
120  HCOLOR= 3
130  GOTO 240
140  REM
       --Calculate circle then which RAM.
150 S = 1 / R
160  FOR J = 0 TO (22 / 7) * 2 STEP S
170 XP = ( SIN (J) * R) + X
180 YP = (( COS (J) * R) * SC) + Y
190 XD =  INT (XP / SV):XT =  INT (XD / 2)
200  IF XD / 2 = XT THEN  POKE FB,0: GOTO 220
210  POKE OB,0
220  HPLOT (XT * SV) + (XP - (XD * SV)),YP
230  NEXT
240  REM
       --Get random values.
250 X = ( RND (1) * 540) + 10
260 R =  INT ( RND (1) * 80) + 1
270  IF X + R > 558 OR X - R < 1 THEN 250
280 Y =  RND (1) * 120 + 5
290 SC = ( RND (1) * .35) + .2
300  IF (R * SC) + Y > 190 OR Y -
     (R * SC) < 1 THEN 280
310  GOTO 140
```

```
320  REM
        -Do border.
330  HPLOT 0,0 TO 279,1: HPLOT 0,1 TO 279,1
340  HPLOT 0,191 TO 279,191: HPLOT
     0,190 TO 279,190
350  HPLOT 1,0 TO 1,191: HPLOT 27
     9,0 TO 279,191
360  RETURN
```

DISPLAY SOFT SWITCHES

Name	Function	Location HEX	Location DEC.	Note
TEXT	On: Display Text	$C051	49233	
	Off:Display Graphics	$C050	49232	
	Read TEXT switch	$C01A	49178	Read
MIXED	On: Text with Graphics	$C053	49235	1
	Off:Full Graphics	$C052	49234	1
	Read MIXED switch	$C018	49179	Read
PAGE2	On: Display Page 2	$C055	49237	2
	Off:Display Page 1	$C054	49236	2
	Read PAGE2 switch	$C01C	49180	Read
HIRES	On: HI-RES Graphics	$C057	49239	1
	Off:LO-RES Graphics	$C056	49238	1
	Read HIRES switch	$C01D	49181	Read
80COL	On: Display 80 columns	$C00D	49165	Write
	Off:Display 40 columns	$C00C	49164	Write
	Read 80COL switch	$C01F	49183	Read
80STORE	On: Store in Aux. Page	$C001	49153	Write 3
	Off:Store in main Page	$C000	49152	Write 3
	Read 80STORE switch	$C018	49176	Read

Notes:-

1 Only effective when TEXT is OFF.
2 Has different function when 80STORE is active.
3 Changes the function of the PAGE2 switch.

AUXILIARY MEMORY SELECT SWITCHES

Name	Function	Location Hex	Dec.	Note
RAMRD	On: Read Aux. 48K	$C003	49155	Write 3
	Off:Read Main 48K	$C002	49154	Write 3
	Read RAMRD switch	$C013	49171	Read
RAMWRT	On: Write Aux. 48K	$C005	49157	Write
	Off:Write Main 48K	$C004	49156	Write
	Read RAMWRT switch	$C014	49172	Read
ALTZP	On: Aux. stack, zero-page and bank switched memory.	$C009	49161	Write
	Off:Main stack, zero-page and bank switched memory.	$C008	49160	Write
	Read ALTZP switch	$C016	49174	Read
80STORE	On: Access Page 1X	$C001	49153	Write 3
	Off:Use RAMRD, RAMWRT	$C000	49152	Write 3
	Read 80STORE switch	$C018	49176	Read
PAGE2	On: Access Aux. memory	$C055	49237	1
	Off:Access Main memory	$C054	49236	1
	Read PAGE2 switch	$C01C	49180	Read
HIRES	On: Access HI-RES Page 1X	$C057	49239	2
	Off:Use RAMRD, RAMWRT	$C056	49238	2
	Read HIRES switch	$C01D	49181	Read

Notes on Auxiliary memory soft-switches:-

1 When 80STORE is on, the PAGE2 switch functions as shown.
When 80STORE is off, PAGE2 does not affect Aux. memory.

2 When 80STORE is on, the HIRES switch enables the PAGE2 switch to select between high-resolution Page 1 areas in main and Auxiliary memory.

3 80STORE has priority over the RAMRD and RAMWRT switches. ie:- If 80STORE is ON, the Page 2 soft switch will still control access to main or auxiliary screen RAM.

HARDWARE JUMPERS AND OUTPUT

There are three jumper blocks and one 4 pole D.I.P switch on the DIGICARD extended 80 column R.G.B. card.
These are:-

LK1 Located just above the main gold connector on the card. Allows the double video soft-switch, AN3 onto the card. May be removed if the combination of 80 column text, normal HI-RES and use of AN3 is desired.

LK2 Near lower front of card. Forces all HI-RES video to text background/foreground colours. The pin closer to the Apple keyboard is the control pin. It is TTL level and may be run from AN2 on the games connector if a soft-switchable system is desired.

J1 Near the top rear of the card. Has two positions. Position closer to the keyboard end of the card selects interpreted HI-RES mode. position closer to rear of card selects Multi-interpreted mode.

SW1 At top rear of card. Selects text colour options.

J2 Video and sync. output connector. From top to bottom, connections are:-

- Horizontal/Vertical sync.
- N.C.
- Common.
- Blue output.
- Green output.
- Red output.

OTHER DIGICARD PRODUCTS FOR THE APPLE

DIGICARD 80

80 column card with extensive on board communications facilities.

DIGICARD 80e

80 column card for the Apple //e.

DIGICARD SERIAL CARD

High speed RS-232 card for printers or communications.

DIGICARD COMMUNICATIONS CARD

A dual purpose card containing an enhanced version of the DIGICARD 80 communications terminal yet is still totally software compatable with other communication programs. (VISITERM, YAM etc.) May also be *used in place of a serial card.*

DIGICARD HI-CAPACITY FLOPPY DISK DRIVES

Twin 5 1/4 inch disk drives that run DOS 3.3, PRODOS, PASCAL and APPLE CP/M. Total of 1.6Mb (800Kb per drive) under PRODOS and PASCAL. Total of 1280Kb (640Kb per drive) under DOS 3.3 and CP/M. CP/M system can be easily made bootable (in any slot) from the Hi-capacity drives.

Note:- The card to run any industry standard 250Kbps disk drives is also available separately.

DIGICARD DISK DRIVE

Fully APPLE software and hardware compatable with many advantages.

DIGICARD R.F. MODULATOR

Use your Apple //e on a standard Australian television set.

DIGICARD 16K RAM BOARD

For PASCAL, PRODOS or general memory expansion. (Apple 2+)

DIGICARD HARD DISK

Probably the fastest hard disk in the world available for the Apple //e and 2+ computers. Uses D.M.A. (Direct memory Access) to put bytes into the Apples memory at 400Kbytes/sec. (Typically 50Kbytes/sec. under an operating system.) Runs DOS 3.3. PRODOS, PASCAL and APPLE CP/M. Can be configured easily for all four operating system on the one disk. Capacities from 10Mb to 70Mb available on order. (Special systems may run up to three 70Mb drives from the one card.)

All DIGICARD products are designed and manufactured in Australia by:-

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